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EXAMINER

ZERVIGON, RUDY

ART UNIT

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1792

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DELIVERY MODE

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/791,030	Applicant(s) LIU ET AL.	
	Examiner Rudy Zervigon	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 December 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 61,64-68,70,75 and 77-79 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 61,64-68,70,75 and 77-79 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on December 23, 2009 has been entered.

Drawings

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the “first gas flow pathway”, “second gas flow pathway”, “third gas flow pathway”, “fourth gas flow pathway”, “first gas source”, “second gas source”, “first precursor source”, “second precursor source”, must be shown or the features canceled from the claims. No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the

Art Unit: 1792

renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 63, 64, 70, 75, 77, 78 are rejected under 35 U.S.C. 102(b) as being anticipated by Park, Young-Hoon (US 20020007790 A1) as demonstrated by Aral; Gurcan (US 6022483 A)¹. An atomic layer deposition (ALD) apparatus, comprising: a reaction chamber (100; Figure 1; [0022]) having a wafer support (not shown - “wafer is mounted”; Abstract) disposed therein; a first gas flow pathway (220; Figure 1; [0044]) coupled between a first precursor source (210; Figure 1, [0046] - compare to Applicant’s “A,” “B” sources; All Figures) and the reaction chamber (100; Figure 1; [0022]) through a gas distribution apparatus (Figure 3 - [0012]-[0014]) disposed within the reaction chamber (100; Figure 1; [0022]); a second gas flow pathway (240; Figure 1; [0044]) coupled between a second precursor source (230; Figure 1, [0043] - compare to Applicant’s “A,” “B” sources; All Figures) and the reaction chamber (100; Figure 1; [0022])

¹ See MPEP 2131.01.

Art Unit: 1792

through the gas distribution apparatus (Figure 3 - [0012]-[0014]) disposed within the reaction chamber (100; Figure 1; [0022]); a third gas flow pathway (holding V14, V2, V3; Figure 1) coupled between a first gas source (310; Figure 1 - compare to Applicant's "A","B" sources; All Figures) different than the first and second precursors (210/230) and the reaction chamber (100; Figure 1; [0022]) through the gas distribution apparatus (Figure 3 - [0012]-[0014]) disposed within the reaction chamber (100; Figure 1; [0022]); a fourth gas flow pathway (holding V6, 262, V7, 260; Figure 1) coupled between a second gas source (250; Figure 1 - compare to Applicant's "A","B" sources; All Figures) different than the first and second precursors (210/230) and the reaction chamber (100; Figure 1; [0022]) through the gas distribution apparatus (Figure 3 - [0012]-[0014]) disposed within the reaction chamber (100; Figure 1; [0022]), the fourth gas flow pathway (holding V6, 262, V7, 260; Figure 1) characterized by two separate (V6 or V8 lines), selectable gas flow pathways, one of which has a higher conductance² than the other; and a pumping (All downstream of TV; Figure 1, [0040]) arrangement that includes a controllable flow conductance (TV, V23, V24, V25; Figure 1) and a pump (410; Figure 1), the pumping (All downstream of TV; Figure 1, [0040]) arrangement being coupled downstream of the reaction chamber (100; Figure 1; [0022]), as claimed by claim 77. With respect to Applicant's claim to relative conductance, the Examiner believes that such a claimed condition is met by the prior art because Applicant's means for controlling the relative conductance is drawn from a superposition of variables with individual contributions to the overall conductance. Applicant's specification states "...with conductances *determined by the*

² In this context "conductance" is an attribute of the "flow pathway" and is thus used here as an adjective. Conductance = volumetric flow rate across flow element / change in pressure across flow element. See Aral at column 6; lines 41-58. Further, Applicant's specification notes that piping conductance is a function of piping

Art Unit: 1792

conduit lines, elbows, valve and any restrictor components in the lines between the pressure sources 409/411 down to and including the entrance ...” [0055]. Further, the prior art’s individual valves, as a component to the overall conductance for the line(s) containing the valve(s), can likewise be controlled, i.e. used, to achieve the claimed results. When the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).

Park further teaches:

- i. The ALD apparatus of claim 77, wherein the third gas flow pathway (holding V14, V2, V3; Figure 1) is coupled between a first gas source (310; Figure 1 - compare to Applicant’s “A,” “B” sources; All Figures) different than the first and second precursors (210/230) and the reaction chamber (100; Figure 1; [0022]) through portions of the first and second gas flow pathways (220,240; Figure 1; [0044]), as claimed by claim 78
- ii. The ALD apparatus of claim 78 wherein the controllable flow conductance (See Footnote 2 and Applicant’s [0055]) is switchable from a first state (on/off and values in between) to a second state (on/off and values in between), as claimed by claim 63. When the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).

elements and the piping itself – “with conductances determined by the conduit lines, elbows, valve and any restrictor components in the lines between the pressure sources 409/411 down to and including the entrance ...”. [0055].

Art Unit: 1792

- iii. The ALD apparatus of claim 78, wherein the controllable flow conductance (See Footnote 2 and Applicant's [0055]) comprises a throttle valve (TV; Figure 1), as claimed by claim 64
- iv. The ALD apparatus of claim 78, wherein the controllable flow conductance (See Footnote 2 and Applicant's [0055]) is switchable under the control of a controller (not shown; [0081]) to switch states (on/off and values in between) according to a difference in residence times (as manifested by pressure) for passage of gas between (i) upstream gas sources and the reaction chamber (100; Figure 1; [0022]), and (ii) the reaction chamber (100; Figure 1; [0022]) and the controllable flow conductance (See Footnote 2 and Applicant's [0055]), as claimed by claim 70. Further, when the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).
- v. The ALD apparatus of claim 78 wherein the controllable flow conductance (See Footnote 2 and Applicant's [0055]) is switchable under the control of a controller (not shown; [0081]) to switch states (on/off and values in between) to maintain a nominally constant ratio between (i) gas flow pathway conductances (See Footnote 2 and Applicant's [0055]) upstream of the reaction chamber (100; Figure 1; [0022]), and (ii) gas flow pathway conductances (See Footnote 2 and Applicant's [0055]) downstream of the reaction chamber (100; Figure 1; [0022]) during both exposure and purge periods of an ALD cycle, as claimed by claim 75. Applicant's claimed requirement of "during both exposure and purge periods of an ALD cycle" is a claim requirement of intended use in the

Art Unit: 1792

pending apparatus claims. Further, when the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claim 79 is rejected under 35 U.S.C. 103(a) as being unpatentable over Park, Young-Hoon (US 20020094689 A1) as demonstrated by Aral; Gurcan (US 6022483 A)³. Park and Aral do not teach a controller where the ALD apparatus of claim 77, wherein the controllable flow conductance (See Footnote 2 and Applicant's [0055]) is switchable (on/off and values in between), under the control of a controller (not shown; [0081]), *in time phase* with the two separate (V6 or V8 lines), selectable gas flow pathways of the fourth gas flow pathway (holding V6, 262, V7, 260; Figure 1) during both exposure and purge periods of an ALD cycle, as claimed by claim 79.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the operation of Park's apparatus.

Motivation to optimize the operation of Park's apparatus is for maintaining reactor chamber pressure in a desired range as taught by Park ([0059]).

Art Unit: 1792

7. Claims 65-68 are rejected under 35 U.S.C. 103(a) as being unpatentable over Park, Young-Hoon (US 20020094689 A1) as demonstrated by Aral; Gurcan (US 6022483 A)⁴ in view of Sakai; Hiroyuki et al. (US 5070813 A). Park is discussed above. Park does not teach:

- i. The ALD apparatus of claim 64, wherein the throttle valve (TV; Figure 1) comprises an annular throttle valve (TV; Figure 1) located within the reaction chamber (100; Figure 1; [0022]), as claimed by claim 65
- ii. The ALD apparatus of claim 65, wherein the annular throttle valve (TV; Figure 1) includes multiple vanes, each having an axis therethrough, as claimed by claim 66
- iii. The ALD apparatus of claim 65, wherein the annular throttle valve (TV; Figure 1) includes multiple blades arranged in an iris configuration, as claimed by claim 67
- iv. The ALD apparatus of claim 65, wherein the annular throttle valve (TV; Figure 1) includes multiple blades, each having a number of holes therethrough, at least one of the blades being rotatable about an axis such that holes extending through the rotatable blade align with holes of at least one of the other blades to provide a passage through the annular throttle valve (TV; Figure 1), as claimed by claim 68

Sakai teaches a coating apparatus including an iris throttle valve (10, 11; Figure 1, 2) located downstream from Sakai's chamber 1, Figure 1 for controlling reactor chamber pressure (19, 20; Figure 1). Sakai further teaches:

- i. A throttle valve (10, 11, Figure 1,2) comprises an annular throttle valve (10, 11, Figure 1,2) located within the reaction chamber (1; Figure 1), as claimed by claim 65

³ See MPEP 2131.01.

⁴ See MPEP 2131.01.

Art Unit: 1792

- ii. The deposition apparatus (Figure 1) wherein the annular throttle valve (10, 11, Figure 1,2) includes multiple vanes (10; Figure 2), each having an axis therethrough, as claimed by claim 66
- iii. The deposition apparatus (Figure 1), wherein the annular throttle valve (10, 11, Figure 1,2) includes multiple blades (10; Figure 2) arranged in an iris configuration (Figure 2), as claimed by claim 67
- iv. The deposition apparatus (Figure 1) of claim 65, wherein the annular throttle valve (10, 11, Figure 1,2) includes multiple blades (10; Figure 2), each having a number of holes (a; Figure 2) therethrough, at least one of the blades (10; Figure 2) being rotatable about an axis such that holes (a; Figure 2) extending through the rotatable blade align with holes (a; Figure 2) of at least one of the other blades (10; Figure 2) to provide a passage through the annular throttle valve (10, 11, Figure 1,2), as claimed by claim 68

It would have been obvious to one of ordinary skill in the art at the time the invention was made to replace Aral's throttle valve (118, Figure 1) with Sakai's iris valve.

Motivation to replace Aral's throttle valve (118, Figure 1) with Sakai's iris valve is for reproducing the exhaust rate "with high reproducibility" as taught by Sakai (column 1; lines 53-57).

Response to Arguments

8. Applicant's arguments with respect to claims 61, 64-68, 70, 75, and 77-79 have been considered but are moot in view of the new grounds of rejection.

Art Unit: 1792

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272-1442. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 6pm EST. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner can not be reached please contact the examiner's supervisor, Parviz Hassanzadeh, at (571) 272- 1435.

/Rudy Zervigon/

Primary Examiner, Art Unit 1792